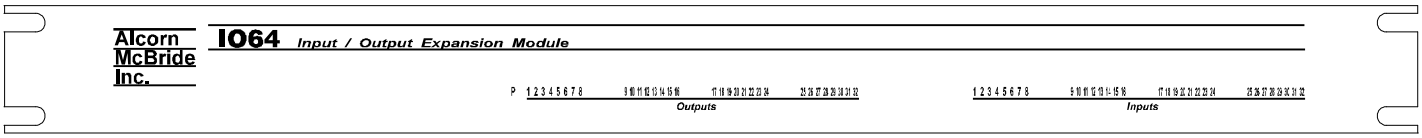
IO64 User's Manual



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Alcorn McBride Inc.
3300 S. Hiawassee Bldg. 105
Orlando, Florida 32835
Tel: (407) 296-5800
Fax: (407) 296-5801

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IO64 User's Manual

Congratulations on your purchase of Alcorn McBride Inc.'s IO64. The IO64 provides 32 optically isolated inputs, 32 dry relay contacts fused at 0.9 amps, and a user programmable serial port. It is an ideal I/O expansion device for the V4 and V16 video disc and show controllers. It can be used stand-alone to execute downloaded scripts containing complex sequences of I/O changes, and can even control laser disc players or other devices using its serial port, just like a V4 or V16. It can also be controlled directly from a PC compatible's serial port. When used with a PC, a communications library is available at no charge to build the ninth bit protocol messages used by all Alcorn McBride equipment.

Settings

Addressing

The IO64 is addressed by downloading a Script to it using the SCRIPT.EXE programming software, much like programming a V16 or V4. For most applications the unit address may be left at 0.

Memory Configuration

The IO64 has 8K of show script memory, expandable to 24K. The unit is shipped with a 2864 EEPROM, which can be changed to a 28256 if required. No hardware configuration is required.

DIP Switch

Position	Use
1	not used
2	not used
3	not used
4	not used
5	not used
6	not used
7	not used
8	on if lcd display installed

Remote Serial Port Operation

The Remote serial port may be configured to operate as an RS-232 port, or to receive MIDI show control messages. Configure it as follows:

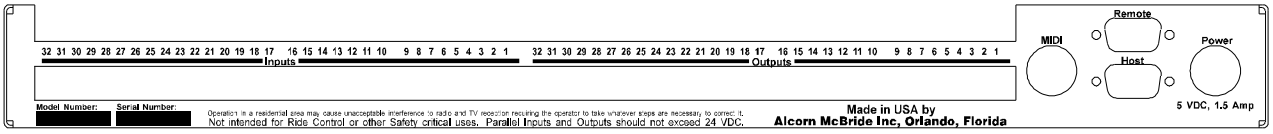
Function	W1	U11 (a 6N138)	Y2
RS-232	installed	not used	3.6864MHz
MIDI receive	not installed	installed	3.0MHz

The MIDI show control messages start IO64 sequences. The protocol is as follows:

Byte	Data	Use
1	f0	system exclusive header
2	7f	system exclusive extended id
3	xx	device id = unit number or 7f (wildcard)
4	02	show control
5	10	control type=sound (10), video (30) or 7f (wildcard)
6	01	go command
7	xx	seq msb in ascii (30-32)
8	xx	seq mid sb in ascii (30-39)
9	xx	seq lsb in ascii (30-39) valid seq numbers are 001-256
10	f7	system exclusive footer

Interconnections

The IO64 has rear connections for serial RS-232 programming (Host), serial device control (Remote), MIDI (same as Remote, but at a different baud rate and voltage level), and a power supply connector. The IO64 also has eight Phoenix type connectors for connecting the inputs, input returns, outputs, and output returns themselves.


32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
Inputs
32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
Outputs
Remote
MIDI
Host
Power
Model Number:
Serial Number:
Operation in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct it.
Not intended for Ride Control or other Safety critical uses. Parallel Inputs and Outputs should not exceed 24 VDC.
Made in USA by
Alcorn McBride Inc, Orlando, Florida
5 VDC, 1.5 Amp

The **Host** (i.e. **Programmer)** Connector should be plugged into one of the V16's serial ports when in use. During programming this port should be connected to the PC's communications port COM1 or COM2. In both cases a straight through female-to-female DB-9 cable is used. If the IO64 is not to be connected with a V16, the following table should be used to wire this connector.

Host Port	
Pin of DB9F	Signal
1	nc
2	TXD from IO64
3	RXD to IO64
4	nc
5	GND
6	nc
7	nc
8	nc
9	nc

The **Remote** port is wired the same as the connector on a PC compatible, just like the V4 and V16. To connect it to a V16 or V4 port, a DB9 female to female cable with a null modem twist should be used. To connect to a disc player, our standard CPN-10 or CS-10 cables may be used.

Remote Port	
Pin of DB9F	Signal
1	nc
2	RXD to IO64
3	TXD from IO64
4	nc
5	GND
6	nc
7	nc
8	nc
9	nc

There are two banks of Phoenix **Input** connectors, labeled *Inputs 1 - 16*, and *Inputs 17-32*. The top bank (two connectors) are the input pins, and the bottom bank (two connectors) are the input return pins.

There are two banks of Phoenix **Output** connectors, labeled *Outputs 1 - 16*, and *Outputs 17-32*. The top bank (two connectors) are the output pins, and the bottom bank (two connectors) are the output return pins.

Controlling the IO64

Default Mode

The IO64 is shipped with a script in it that will return input changes to a V16 via a State Variable Change Message. This means that the V16 is going to use the IO64 simply as an expansion of it's own I/O. If IO64 inputs turn on or off, the IO64 will send a State Variable change message to the V16 to that effect. The IO64 will also accept direct commands from the V16 to turn on, off, blink, or pulse it's outputs. If you are going to use the IO64 in its default mode, you need only plug the IO64 into one of the V16's serial ports, and write programming for the V16. If you wish the IO64 to do more than just be an expansion box for the V16, you can program it to be more intelligent, as described below.

Using the IO64 Inputs

The IO64 inputs work just like V16 or V4 inputs. Each input can be assigned to provide start, pause, stop or reset triggers to any or all sequences downloaded to the IO64. The IO64 can then be programmed to perform stand alone operations in response to these input changes, or can send a message to the V16 or V4, or both.

The IO64 is shipped with a sample script called IO64MAIN.AMX. This script sends a Set State Variable message in response to each of the 32 inputs changing. A different value is sent when the inputs go on, and go off. These state variable values can then be used by a V16 or V4 to trigger their sequences. This sample script can be used as is, or additional functions can be added. As shipped, the script sends changes to state variable 32.

The IO64 inputs are shipped with 1.5K ohm thru DIP resistors which are suitable for operating the inputs off of 24 VDC. Lower operating voltages will require proportionately lower resistance. The positive voltage should be connected to the top row of the rear panel connector, with the return on the lower row.

General Serial Control

The IO64 is controlled by serial messages. The IO64 responds to most ScriptOS serial commands, listed in the V16 manual addendum. The most useful commands are ON, OFF, BLINK and PULSE, plus START. The first four directly affect the relay outputs of the IO64. Start is used to start a sequence of events that have previously been downloaded into the IO64 using SCRIPT.EXE. Note that sequences downloaded to the IO64 can also be looping and autoexec.

These commands are sent at 9600 baud, 9 data bits, 1 stop bit, and no parity. These commands can be sent from a user application, from the V16 in a script, or from the script

software directly to the IO64 without a V16. The commands may be directed to either the Host (AMAX programming) port or the Remote port (port 1).

Programming or Testing the IO64 Using ScriptOS

The IO64 can operate as a stand-alone controller in many situations. SCRIPT.EXE can be used to download up to 256 sequences of 64 steps each, which can turn on, off, blink, or pulse outputs, and receive inputs to trigger sequences. Sequences downloaded to the IO64 can be looping and autoexec, and so can start themselves and run forever, if desired. When used with a V16, V4 or PC, these sequences may also be started using the sequence START command (see the next section for a discussion of V16 communication, and Appendix A for a discussion of serial protocol in general).

To program the IO64 be sure to select Unit Type IO64 in the SCRIPT.EXE unit configuration menu.

A particularly easy mode of testing can be achieved by using ScriptOS to talk directly to the IO64. The IO64 serial port must be connected to a serial port on an IBM PC that is running the script software via a serial programming cable. The downloaded unit address must match the address in the Unit Setup section of ScriptOS, both usually being 0. Enter an output type event or Start event in the script, and hit F10 to single step that line of the sequence. **The script software automatically builds the entire serial message in this mode. Making a data string in the name strings section of ScriptOS is not necessary.** This script can later be downloaded to the IO64 for stand-alone execution or triggering by the V16 or V4.

Messages sent from V16 or V4

The IO64 can be controlled by serial messages sent from the V16. The serial programming port of the IO64 may be connected to any of the serial ports on the V16 or V4. The V4 or V16 port MUST be configured as an AMAX port in the script program's serial configuration section. The serial cable used in this configuration is a straight through DB9F - DB9F cable. This cable can be ordered from Alcorn McBride Inc. The part number for a one foot long cable is **DB9FDB9FP12**.

Here is an example of the Serial Port Configuration menu for an IO64 connected to a V16:

Port	Name	Baud	P	D	S	Type
3	io64	9600	N	8	1	AMAX

Most ScriptOS commands may be directed from a V4 or V16 to the IO64. (Certain commands would have no meaning if executed remotely; goto, for example.) The commands are entered into the event editor in a similar format to the local commands, except that **the destination field is filled in with the name of the serial port to which**

the IO64 unit is connected. The serial port may have any name, but must be of type AMAX, and must match the destination field of the output type commands shown below.

Example

The following is an example line of script that sends a blink command from the V16 to a IO64 connected to serial port 3, for output number 9 to blink at a 2 second 15 frame rate.

Time	Event	Destination	Data1	Data2	Comment
00:00:00	blink	io64	02.15	3	blink cmd

The following is an example line of script that starts IO64 sequence 1 from the same V16 connection described above.

Time	Event	Destination	Data1	Data2	Comment
00:00:00	start	io64		1	start seq 1

Using the IO64 without a V16

The IO64 can be used or tested without a V16 if so desired.

For operation without a V16, a user-supplied program can be written that outputs the entire serial message described in the commands above (including the source address and checksum). If this program is to be written on an IBM PC, our library drivers may be used. These libraries are free, and may be downloaded on our BBS. The BBS can be reached at (407) 296-5802, 2400, 8N1. In this configuration, the IO64 must also be connected to the serial port using the cable described above.

Appendix A: Serial Protocol

The ON Command

The ON command turns on an IO64 output.

Six Byte Format: FF aa 02 dd ch

where:
- FF = Source address. This byte has the eighth and ninth bits set. The PC will send a FF, the V16 will send an 80.
- aa = Target address. This will be the address of the IO64 as configured by SCRIPT.EXE
- 02 = Command byte. This byte tells the IO64 that this is an ON command.
- dd = output to turn on minus 1 (0-31).
- ch = Checksum. Sum of preceding five bytes /2 with the ninth bit set.

The OFF Command

The OFF command turns on an IO64 output.

Six Byte Format: FF aa 03 dd ch

where:
- FF = Source address. This byte has the eighth and ninth bits set. The PC will send a FF, the V16 will send an 80.
- aa = Target address. This will be the address of the IO64 as configured by SCRIPT.EXE
- 03 = Command byte. This byte tells the IO64 that this is an OFF command.
- dd = output to turn off minus 1 (0-31).
- ch = Checksum. Sum of preceding five bytes /2 with the ninth bit set.

The BLINK Command

The BLINK command allows an IO64 output to be blinked at a user-defined rate.

Six Byte Format: FF aa 04 dd pp ch

where:
- FF = Source address. This byte has the eighth and ninth bits set. The PC will send a FF, the V16 will send an 80.
- aa = Target address. This will be the address of the IO64 as configured by SCRIPT.EXE
- 04 = Command byte. This byte tells the IO64 that this is a BLINK command.
- dd = output to blink minus 1 (0-31).
- pp = Period in frames over which to blink. Range is 0-255, allowing blink rates as slow as 8-1/2 seconds at 30 fps.
- ch = Checksum. Sum of preceding five bytes /2 with the ninth bit set.

The PULSE Command

The PULSE command allows an IO64 output to be pulsed on for at a user-defined period.

Six Byte Format: FF aa 05 dd pp ch

where:
- FF = Source address. This byte has the eighth and ninth bits set. The PC will send a FF, the V16 will send an 80.
- aa = Target address. This will be the address of the IO64 as configured by SCRIPT.EXE
- 05 = Command byte. This byte tells the IO64 that this is a PULSE command.
- dd = output to blink minus 1 (0-31).
- pp = Period in frames over which to pulse. Range is 0-255, allowing pulse durations as long as 8-1/2 seconds at 30 fps.
- ch = Checksum. Sum of preceding five bytes /2 with the ninth bit set.

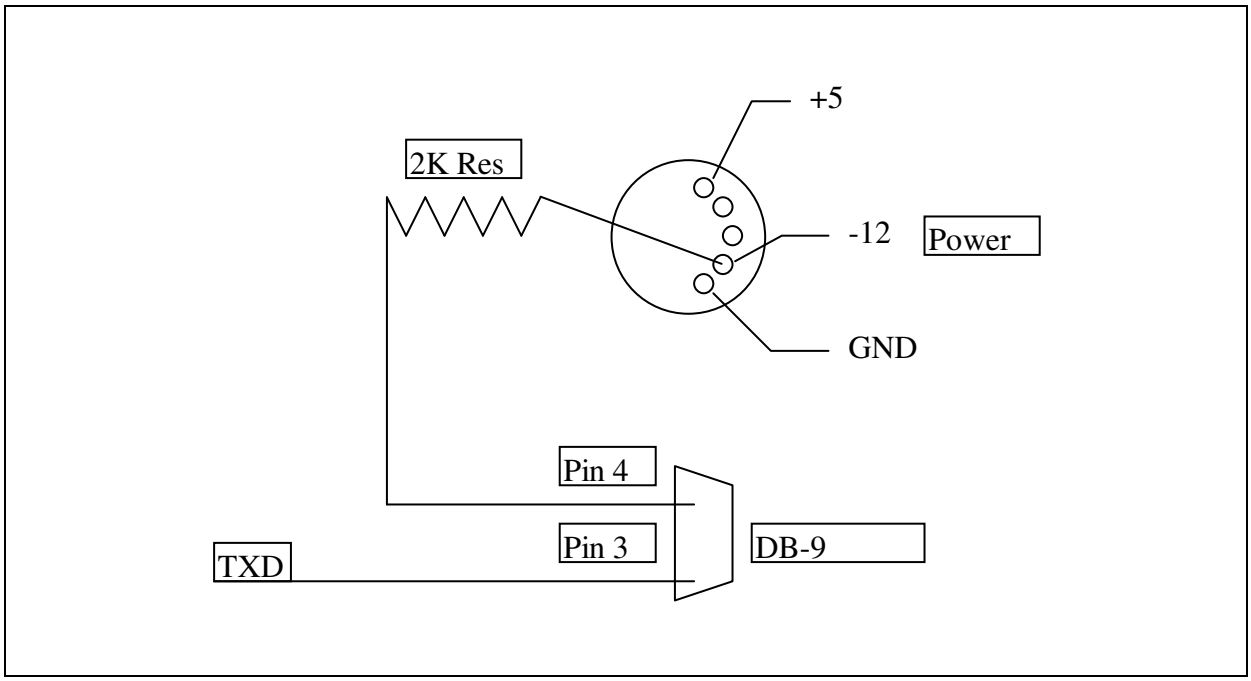
The START Command

The START command is used to start a sequence from within another sequence. The V16 can transmit this message to the IO64 to start an entire sequence of previously downloaded events.

Five Byte Format: FF aa 18 ss ch

where:
- FF = Source address. This byte has the eighth and ninth bits set. The PC will send a FF, the V16 will send an 80.
- aa = Target address. This will be the address of the IO64 as configured by SCRIPT.EXE
- 18 = Command byte. This byte tells the IO64 that this is a start command.
- ss = sequence number to start minus 1 (0-255).
- ch = Checksum. Sum of preceding four bytes MOD 256 with the eighth bit cleared, and the ninth bit set.

Appendix B: Midi Output from Remote Port



MIDI Output from the IO64 may be obtained by connecting a 2K resistor from the power connector pin 4 (-12v) to the DB-9 remote connector pin 4. This creates a unipolar 24 volt swing between pins 3 and 4 of the DB-9, with the 2K resistor current limiting it to MIDI levels. These two wires may be connected to a MIDI input opto, and the IO64's port set to MIDI on the serial configuration screen.